NEWLY RECOGNIZED *AEDES AEGYPTI* PROBLEMS IN MANILA AND BANGKOK *

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During the rainy season of 1956, an epidemic of "hemorrhagic fever" occurred in children in Manila. At the same time, we were in the area conducting a search for arthropod-borne viruses. Clinical, epidemiologic, and laboratory observations of the epidemic were included in the arthropod-borne virus survey, although the relation of the disease to the arthropod-borne virus group was not recognized at that time. Over 750 cases were hospitalized with about 10 percent case fatality. A number of cases had been seen by pediatricians as early as 1954 and the disease had been named Philippine Hemorrhagic Fever (1).

During the rainy season of 1958, an epidemic of a disease called "hemorrhagic fever" or "mystery disease" occurred in Bangkok. Over 2,500 cases were hospitalized with about 10 percent case fatality. As in Manila, a few cases had been observed annually since 1954, but never in epidemic proportion in Bangkok until 1958. At the height of the epidemic a request for our services was made by the King of Thailand through the International Cooperation Administration. We arrived in Bangkok shortly after the peak of the epidemic and while many cases were still occurring.

Clinical manifestations ranged from a mild febrile disease with a slight bleeding tendency to serious cases associated with extensive hemorrhages in the skin and gastro-intestinal tract, and severe shock (2, 3). Cases occurred principally in children under 5 years of age. Clinically and epidemiologically this disease does not resemble closely epidemic hemorrhagic fever of the type encountered in Korea and Manchuria, Kyasanur forest disease of India or any other hemorrhagic disease heretofore described.

The Philippine survey was conducted from August through October of 1956, in an area of southwestern Luzon extending a distance of approximately 100 miles and including the city of Manila. Over 42,000 adult mosquitoes representing at least 51 species of 8 genera were collected by several methods, including animal-baited stable traps, light traps, sweeping, diurnal and nocturnal biting collections, and diurnal resting station collections. Among the most common species collected in urban areas were *Culex quinquefasciatus* and *Aedes aegypti;* in rural areas, *Culex tritaeniorhynchus, Culex fuscocephalus,* and *Aedes albopictus.*

During the course of the Bangkok survey in September of 1958, over 10,000 adult mosquitoes were collected, principally inside urban dwellings. The predominant species were *Culex quinquefasciatus, Aedes aegypti,* and *Culex tritaeniorhynchus.*

From acute sera of cases diagnosed as Philippine hemorrhagic fever, several viruses were isolated and proved to be strains of 2 new agents which have been named dengue 3 and dengue 4, on the basis of their close immunologic relationship to the classical dengue types 1 and 2 (2). Dengue type 3 was also isolated from a pool of *Aedes aegypti* mosquitoes.

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This appears to have been the first isolation of a dengue virus from naturally infected wild mosquitoes (2).

From the acute sera of cases of Thai hemorrhagic fever, several agents identified as strains of dengue 2 and chikungunya viruses have been isolated. From Thai *Aedes aegypti* mosquitoes, 3 isolations of dengue 2 have been made (2). Chikungunya virus, previously known from Africa, is believed to be transmitted by *A. aegypti* and possibly other mosquito species.

On the basis of the virus isolations and detailed serological studies, it appears quite certain that the etiology of the Manila epidemic was associated principally with dengue 3 and 4 viruses, while the Thai epidemic was associated principally with dengue 2 and chikungunya viruses. The restricted age distribution of the disease may be partially due to the immunity status of the population in which the older age groups exhibit dengue immunity. The most likely vector in both areas is *Aedes aegypti,* partially corroborated on evidence of the virus isolations as well as epidemiologic evidence. Previous dengue epidemics in these countries have occurred during the same season. No classical dengue outbreaks have been reported in these countries in recent years.

In Manila, the majority of daytime house collections included *Aedes aegypti,* which, on the basis of these collections, was second in frequency only to *Culex quinquefasciatus. Aedes aegypti* was found breeding commonly in a variety of artificial containers inside and outside houses throughout the Manila metropolitan area. *Aedes albopictus,* another proven vector of classical dengue was present in urban areas in comparatively low numbers, but was abundant in rural areas, where *Aedes aegypti* was not found. Hemorrhagic fever occurred only in *Aedes aegypti* infested areas.

In Bangkok, *Aedes aegypti* was collected in the great majority of the houses examined. The exceptions were in the wealthy residential sections including those occupied by Europeans and Americans where *A. aegypti* mosquitoes were less abundant and the case incidence was negligible. As in Manila, *A. aegypti* was second in frequency only to *Culex quinquefasciatus* on the basis of daytime house collections. *Aedes albopictus,* although previously reported for Bangkok, was not collected during this survey. *Aedes aegypti* larvae were commonly found in artificial containers inside and outside houses throughout the city. In the poorer districts of the city, rain water is used extensively and is stored in a variety of containers. Large earthenware jars known as "Shanghai jars" were among the most common sources of *A. aegypti* larvae. Flower vases and water-containing ant barriers inside houses were also commonly infested. In some houses, larvae were purposely kept in open pans as a source of live food for pet fighting fish. An additional source of *A. aegypti* in Bangkok was the bilge water in the many small boats, which harbor a relatively large transient population on the rivers and "klongs" of the city.

Adult *Aedes aegypti* were typically found resting inside houses on hanging clothing, clothes lines, bits of string and wire, picture frames, bed nets, and in piles of clothing, boxes and baskets.

No efforts to control the *Aedes aegypti* mosquito in Manila and Bangkok during or after the epidemic have been made to our knowledge. Although these epidemics caused a great deal of alarm and hysteria since the disease attacked young children with high case fatality rate, malaria control occupied the full attention of the agencies concerned with mosquito control in both areas and perhaps rightly so. In addition, Bangkok in 1958 and in 1959 had devastating epidemics of cholera. With limited finances and trained personnel available in both areas, the problem of *Aedes aegypti* control, although of potential severe consequence, has apparently been assigned a low priority as against more pressing public health problems.

A number of public health officials are skeptical regarding the feasibility of an *Aedes aegypti* control program in view of local conditions and express hope that a

vaccine may be developed which will serve as a substitute for mosquito control. Of this, we are skeptical.

It is interesting to note, however, that in malarious areas in these countries, where residual house spraying has been directed against the malaria vector, the *Aedes aegypti* mosquito cannot be found. Its control in these areas has apparently been a side result of the *Anopheles* control campaign. The urban areas of Manila and Bangkok, however, are not within the malaria zones. Some attention has been given to mosquito control in Bangkok but this is being expended largely in the filling of "klongs" which are a source of mosquito species other than *Aedes aegypti*.

In conclusion, newly recognized severe febrile hemorrhagic diseases of children appeared in epidemic form in Manila and Bangkok in 1956 and 1958, respectively. Philippine hemorrhagic fever has been associated etiologically with dengue 3 and 4 viruses, while Thai hemorrhagic fever has been associated etiologically with dengue 2 and chikungunya viruses. The vector in both cases appears to have been the *Aedes aegypti* mosquito on the basis of virus isolations and epidemiologic considerations. The problem of control of *Aedes aegypti* in these areas is one of relative importance and in comparison to more urgent public health problems appears to have been relegated to a low priority despite the hysteria produced at the time of the epidemics.

References

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